

MOULT IN SOME BIRDS OF PALNI HILLS, WESTERN GHATS¹

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(With one text-figure)

Key words: Moulting, *Garrulax jerdoni*, laughing thrush, *Zosterops palpebrosa*, white-eye, *Muscicapa albicaudata*, verditer flycatcher, Palni Hills.

Bird ringing studies at Kodai Hills in winter and summer indicate that most of the resident species undergo a complete moult once a year soon after breeding (April-May), which is expected to be complete not later than August in all the species. Moult duration for three species, namely *Garrulax jerdoni*, *Zosterops palpebrosa*, and *Muscicapa albicaudata* were estimated. Smaller birds tend to have a shorter duration than larger species. Post-juvenile moult was observed in two species of bulbuls (*Pycnonotus jocosus* and *Hypsipetes madagascariensis*). Variation in commencing dates at different altitudes was also observed within a species.

INTRODUCTION

The seasonality of the Palearctic migrants passing through and wintering in the Western Ghats, and the life cycle of most of the resident species, are poorly understood. Bird ringing camps organised in different seasons in 1990-91 at Palni Hills by the Bombay Natural History Society provided valuable information on the seasonality of the wintering Palearctic migrants and the altitudinal movements of resident birds. Based on the data collected on moulting of some resident species of Palni Hills during November 1990 and April to June 1991, an attempt been made to study primary moult and its duration.

STUDY AREA

Kodaikanal hills are situated at an altitude of 2100 m on the easternmost tip of the Palni Hills, an off-shoot of the main Western Ghats. A circular main road begins from Kodaikanal (10° 41' N, 77° 29' E), passes through Gundar,

Poomparai, Paricombai, Mannavanur, Berijam, Mathikattan Shola, Pillar rock and ends at Kodaikanal. Bird netting was carried out on either side of the road upto 4 km before and after Poomparai, which lies about 20 km from Kodaikanal on the ring road. Poomparai village is surrounded by cultivated land, with plantations of *Pinus*, *Eucalyptus* and *Acacia* spp. Natural primary forest is restricted to isolated pockets and at the edges of two plantations. Diverse microhabitats such as *shola* pockets, primary forests, scrub jungle, clear felled areas with secondary growth and various plantations (acacia, pine, and eucalypt), provide for a great abundance of birds. The remnant original forests and the clear felled area with secondary growth are ideal for netting. The exotic weed *Eupatorium* occurs in patches.

The other areas covered with netting were Berijam on the ring road at an altitude of about 2500 m, and Marian *shola* and Pulavachar which lie 10 km and 18 km away from Berijam, on the Berijam-Munnar Road before Top station. Very good *shola* patches are found in Berijam and Marian *shola*. At Pulavachar most of the primary forests have been cleared for plantation.

Netting was also carried out at the moist deciduous forests around Oothu and Pannaikadu

¹Accepted March, 1997

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MOULT IN SOME BIRDS OF PALNI HILLS

area situated at an altitude of 1000-1100 m between Battlagundu and Kodaikanal. Plantations adjacent to these forests were mainly coffee and orange.

METHODS

Birds were netted with mistnets from November 5 to November 20, 1990 and April 20 to June 7, 1991 (summer). All the birds caught and handled for ringing were examined for moult. Though netting was not done for the full month in April and June, the birds caught during the last week of April, and first week of June

were taken as the samples for summer. The birds examined for moult during November were taken as the samples for winter.

Primary feathers were numbered from distal (1) to proximal (10), including the much reduced distal primary, making a total of ten primaries. Similarly, eight secondaries were also numbered. The primaries, secondaries and the rectrices (12 in number) were examined for moult which was recorded on separate moult cards by assigning each primary and secondary feather an integral score between '0' (old feathers) and '5' (full grown feathers). The British Trust for Ornithology (BTO) notation was adopted (Snow

Table 1
NUMBER OF BIRDS IN MOULT IN DIFFERENT MONTHS

Species	April			May			June		
	Total caught	Birds in moult		Total caught	Birds in moult		Total caught	Birds in moult	
		Wing	Tail		Wing	Tail		Wing	Tail
<i>Garrulax jerdoni</i>	77	5	16	110	23	24	33	26	24
<i>Zosterops palpebrosa</i>	77	-	7	70	12	2	20	11	6
<i>Megalaima viridis</i>	8	-	-	5	1	-	9	5	-
<i>Pycnonotus jocosus</i>	23(A) 2(J)	- 1	5 -	18(A) 1(J)	- 1	4 -	8(A) 3(J)	- 2	- -
<i>Muscicapa albicaudata</i>	23	-	-	20	1	1	4	1	-
<i>Pomatorhinus schisticeps</i>	4	-	-	3	-	1	2	2	-
<i>Culicicapa ceylonensis</i>	4	-	-	5	3	-	-	-	-
<i>Parus xanthogenys</i>	5	-	2	1	-	1	2	1	-
<i>Brachypteryx major</i>	26	-	1	38	-	-	-	-	-
<i>Chrysocolaptes lucidus</i>	-	-	-	2	2	-	-	-	-
<i>Hypsipetes indicus</i>	-	-	-	7	4	-	2	-	-
<i>Hypsipetes madagascariensis</i>	9(A) 3(J)	1 1	1 1	- 1(J)	- 1	- 1	1 -	1 -	1 -

Note (A) = Adult (J) = Juvenile

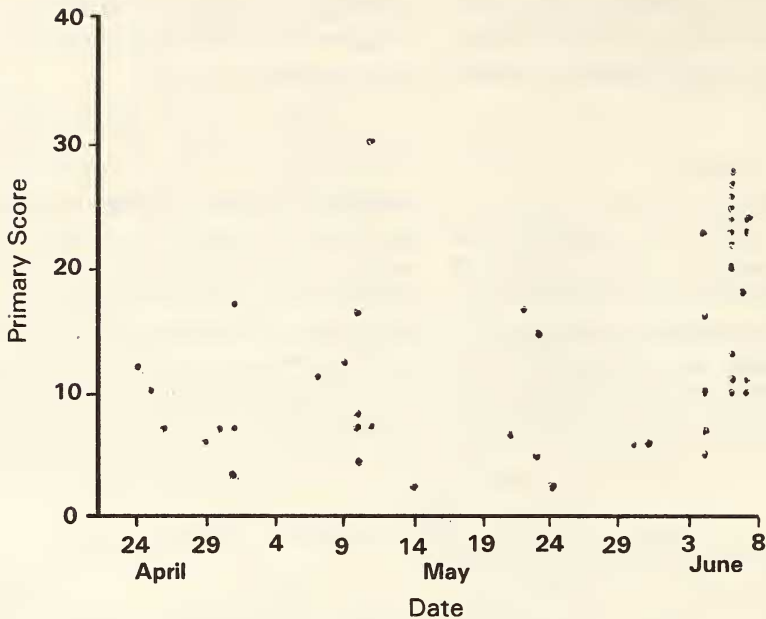


Fig. 1: Progress of primary moult in *Garrulax jerdoni*

1967) for scoring. A score of '1' was given to a feather missing or in pin, '2' '3' and '4' to one-third, two-thirds, and nearly full grown feathers. The scores for all the ten primaries and eight secondaries of each wing were then added separately to get a primary moult score with a maximum of 50 and a secondary score of 40.

Moult scores of different individuals of laughing thrush were plotted against the dates of capture to estimate the duration, starting, and ending dates of moult. Duration of moult was also calculated from the rate of feather growth of an individual bird caught more than once during its moulting period. Secondary scores of a few species were plotted against the primary score, to establish the relation between primary and secondary growth.

Generally, the word 'moult' denotes primary moult unless otherwise mentioned. As the data collected were from the earlier stage of the moult, the commencing date of the moult is evident from this study.

White-breasted Laughing thrush
Garrulax jerdoni: The first adult bird in primary moult was obtained with the score of '12' on April 24. However, among the 33 adults caught during the first week of June, 21% had yet to commence the moult. Moreover, the moulting individuals had wide variation in moult score. This indicates that the commencing date of primary moult also ranged from mid-April to mid-June (Table 1 and Fig. 1)

Among 57 moulting birds, the only individual seen with arrested moult was also the one with the maximum score (30). It was caught on July 11. The birds observed with a moult score between 20 and 30 in early June must have commenced moulting in mid-April. Since the laughing thrush had obtained 50% of the primary moult score in seven weeks (mid-April to early June) it could be expected to complete the moult in another seven weeks i.e. by the end of July. Possibly, the moult duration for this species was around 100 days (14 weeks).

MOULT IN SOME BIRDS OF PALNI HILLS

TABLE 2
NUMBER OF GROWING PRIMARIES IN DIFFERENT SPECIES

Species	No. of birds in moult	No. of primaries in growth				
		1	2	3	4	5
<i>Garrulax jerdoni</i>	57	15	33	7	2	-
<i>Zosterops palpebrosa</i>	19	6	11	1	-	1
<i>Megalaima viridis</i>	6	1	5	-	-	-
<i>Pycnonotus jocusus</i>	3	1	2	-	-	-
<i>Muscicapa albicaudata</i>	3	1	2	-	-	-
<i>Pomatorhinus schisticeps</i>	2	-	2	-	-	-
<i>Parus xanthogenys</i>	1	1	-	-	-	-
<i>Culicicapa ceylonensis</i>	3	-	1	1	1	-
<i>Chrysocolaptes lucidus</i>	2	2	-	-	-	-
<i>Hypsipetes indicus</i>	3	3	-	-	-	-

Moult duration calculated on the rate of growth from retrapped birds varied between 100-116 days. Though the number of primaries growing concurrently varied from 1 to 4, most moulting individuals were observed with two primaries growing concurrently followed by one.

In all individuals, secondary moult commenced while the primary moult was in progress. Generally, like the secondary moult, the tail moult started after the commencement of the primary moult. However, in some individuals, tail moult preceded the primary moult.

Among 130 young birds examined for moult, post-juvenile moult was not noticed till early June.

White-eye *Zosterops palpebrosa*: In this species, the primary moult commences from the first week of May. It was evident that all the 71 adults caught and examined for moult during April had not commenced moulting. Though the commencing date is two weeks later than that of the laughing thrush, 45% of the adults caught in the first week of June were yet to commence their moult. Birds with a moult score between 20 and

30 in early June might have started the moult in early May, and could be expected to complete it by early July. Hence, the duration would be 8-9 weeks.

An unmoulted adult caught on April 20 was retrapped with a score of '19' on May 22. Since the score had increased from '0' to '19' within 30 days (assuming that it had commenced moulting a day after the first capture), based on the rate of growth, the duration should be less than 79 days. As none of the birds was seen in primary moult till the end of April, it must have commenced in the first week of May at the earliest, in which case the duration would be around 58 days.

The secondary moult was noticed after the primary score reached '15'. Tail moult was observed in some individuals before the primary moult had started. The number of primary feathers in growth varied from 1 to 3. The majority of moulting birds were seen with two feathers in growth (Table 2).

Small green barbet *Megalaima viridis*: A total of 25 adults were caught from Poomparai (high altitude) and Pannaikkadu (lower altitude) area. Out of them, six were moulting. The birds

caught till the middle of May at Poomparai were yet to begin moulting. The two birds caught on May 21 and June 7 had a moult score of '3' and '6' respectively. Out of the seven individuals caught on June 2 at Pannaikkadu, four were in moult, with a score varying between '6' and '26'. The moult commences in the third week of May at Poomparai; at Pannaikkadu it is perhaps much earlier than at Poomparai. Out of six moulting birds, five were observed with two primaries growing concurrently (Table 2). The duration could not be calculated as the sample was small.

Nilgiri Verditer flycatcher *Muscicapa albicaudata*: Out of the 47 adults caught between late April and early May, only three birds were in moult. The first such bird was obtained on May 17 with the score of '22'. The other two were caught in the first week of June and had a score of '26' and '29'. This shows that only a small population of this species undergoes moult in May and June, and the majority of the population will moult at a later date. However, the rate of growth calculated from a retrapped individual indicated that the moult was fast and its duration short. In a 40 days interval, the increase in score was '29'. Assuming that the moult had commenced the day after its first capture, the duration would be less than 69 days.

Greyheaded flycatcher *Culicicapa ceylonensis*: Among the nine adults, the first six caught between late April and early May had not commenced moulting. The remaining three, caught between May 14 and 21, had scores of '11' and '12'. This indicates that the species commences its primary moult in early May.

Scimitar babbler *Pomatorhinus schisticeps*: Seven birds caught in April and May had not commenced moulting, but the two birds netted on June 5 and 6 had a moult score of '6', indicating that the moult commences by the end of May or early June.

Yellow-cheeked tit *Parus xanthogenys*: Out of the eight individuals netted between April

and early June, only one caught on June 7 was moulting and had a moult score of '9', indicating that moult must have commenced at the end of May.

Tickell's flowerpecker *Dicaeum erythrorhynchos*: Four adults were netted during the study period. Adults in April and May had an advanced moult score between '35' to '45' and the one caught in early June had completed its moult.

Larger goldenbacked woodpecker *Chrysocolaptes lucidus*: Two birds caught on May 18 at Oothu were in moult, with a score of '19' and '22'.

Yellowbrowed bulbul *Hypsipetes indicus*: Out of the seven birds caught on May 18 and 19, four were in moult with the score between '9' and '15'. The two birds caught in the first week of June had yet to commence moulting.

Black bulbul *Hypsipetes madagascariensis*: An adult bird with a score of '9' on April 23 was the only moulting bird among the nine examined in the same month. The only adult caught in June had a score of '18'. Among the four juveniles, two were in post-juvenile moult.

Redwhiskered bulbul *Pycnonotus jocosus*: A total of 49 adults and six juveniles were caught and examined between April and early June. Till June 7, none of the adults had commenced wing moult. A few adults were observed in tail moult. Post-juvenile moult was observed from April. Out of the six juveniles examined in three months, four were in moult with scores ranging from '5' to '20'.

Other species: The only grey jungle fowl *Gallus sonneratii* netted on May 18 had a score of '14'. Among the two spotted doves *Streptopelia chinensis*, one had arrested its primary moult after renewing four inner primaries. The white-bellied shortwing *Brachypteryx major albiventris* one of the commonest species in the Kodai hills, had not commenced wing moult till June 7. In the 65 adult birds, only tail moult was noticed in some individuals. The other common species of Kodai

hills not observed in moult were the blackbird *Turdus merula*, jungle myna *Acridotheres fuscus* and black-and-orange flycatcher *Muscicapa nigrorufa*.

DISCUSSION

The studies at Palni Hills in winter and summer indicate that most of the resident species undergo a complete moult once a year, soon after their breeding in summer. Moulting is completed between July and August in all the species, as most of them are in partial primary moult till early June, while in November all the species seen have fresh as well as slightly worn primaries. This indicates that primary feathers must have been renewed two to three months earlier, that is before the end of August. Probably the same primaries were retained till April and May, by which time they became frayed with age. As the post nuptial moult is expected to be completed between July and August, it is clearly not possible for them to undergo another moult before November. The fresh primaries observed during November and the old primaries about to be renewed in April confirmed that there was no moult from December to March. Thus this study clearly shows that the birds of the Palni Hills have a definite period (April to August) to complete their moult after breeding (February to April).

Feather replacement: Though the commencement date of the primary moult varied between species and also between individuals of the same species, the pattern of feather replacement in individuals of all the species was the same. They started from the innermost primary and progressed outwards. The secondary feathers generally started from the outer feather and progressed inwards initially, and later from the middle and the innermost secondaries also. Tail feathers also generally commenced from the middle feathers and progressed both ways, but in some individuals the feather replacement was irregular.

The same kind of regular replacement was observed in the post nuptial and post-juvenile moults of the resident birds of Tirupati Hills of the Eastern Ghats, especially in three species of bulbuls namely whitebrowed (*Pycnonotus luteolus*), redvented (*P. cafer*) and redwhiskered (*P. jocosus*) (Balachandran *et al.* 1995). However, in the resident birds of Point Calimere, even within the same species (*P. luteolus*, *P. cafer*), the feather replacement was irregular and birds with moult were observed throughout the year (unpublished data). This may be due to the absence of definite breeding seasons at Point Calimere, where both species breed throughout the year. However, at Tirupati and Kodai Hills all birds complete breeding in a particular season and undergo a post-nuptial moult soon after breeding.

Commencing date: Variation in commencing date among the species may be due to the variation in the breeding season. The most common species, the white-breasted laughing thrush, was probably the earliest breeder among the resident species, and also had the earliest commencing date (mid-April). From the status of the brood patch, it was inferred that a smaller population of the birds caught in April were brooding and attending the nest. In May, very few birds had a brood patch, and the proportion of young birds was high in late May and early June.

Other species which commenced moulting in April included the Tickell's flowerpecker. Scimitar babbler and yellow-cheeked tit were the late moulting species, they commenced moult at the end of May. The non-moulting species during the study period were the blackbird, black-and-orange flycatcher, white-bellied shortwing and redwhiskered bulbul (only adult).

The commencing date of moult for the small green barbet was seen to vary at different altitudes. Birds from lower altitudes commence moulting much earlier than high altitude forms. This may be due to the abundance of food, especially *Ficus* sp., the favourite fruit of many birds commonly found at low altitudes.

Moult duration: The moult duration mainly depends upon the rate of feather growth. It appears that smaller birds tend to have a shorter duration than bigger birds. Among the estimated duration for three species (laughing thrush, verditer flycatcher and white-eye), the smallest bird (the white-eye) had the shortest duration (58 days) and for the largest bird (the laughing thrush) it was around 100 days. The duration for the verditer flycatcher, which is larger than the white-eye, and smaller than the laughing thrush, was around 70 days.

Arrested moult: Arrested moult is likely to lengthen the total duration of moult, which also enables long distance migrants to make use of partly new and therefore efficient full wing (Kozlova in Pienkowski 1976). Arrested moult was noticed in only two individuals among all the species at Kodai Hills. As these birds are breeding residents, they have no need to maintain a full wing by arresting the moult to fly long distances. Hence, they probably maintain a continuous feather growth.

Moulting and breeding do not overlap, as the moult starts after breeding. This is evident from the condition of the brood patch.

The post-juvenile moult has been observed only in redwhiskered and black bulbuls. Similar post-juvenile moult occurs in three species of bulbuls (whitebrowed, redwhiskered, and redvented) one month after breeding at Tirupati Hills (Balachandran *et al.* 1995).

ACKNOWLEDGEMENT

This study was carried out as part of the Bird Migration Study of the Bombay Natural History Society (BNHS), supported by the U.S. Fish & Wildlife Service under a grant from PL-480 released through Ministry of Environment, Wildlife and Forests of India. I gratefully acknowledge permission to work in the area by the Tamil Nadu Forest Department. I thank Mr. J.C. Daniel, former Director of BNHS for his guidance and for going through the manuscript.

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